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**AQUATIC INVERTEBRATES AND HABITAT AT A FIXED  
STATION ON THE BLACKFOOT RIVER,  
MISSOULA COUNTY, MONTANA**

August 22, 2001

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**A report to  
the Montana Department of Environmental Quality  
Helena, Montana**

**by  
Wease Bollman  
Rhithron Associates, Inc.  
Missoula, Montana  
May 2002**

## INTRODUCTION

This report is one of 38 brief interpretive summaries of data assembled as part of a statewide, multi-year study conducted by the Montana Department of Environmental Quality (MT DEQ). Each report discusses information generated from a single benthic invertebrate sample collection and habitat evaluation at a fixed station established on a gauged river or high-order tributary. The present treatise focuses on the aquatic community sampled on the Blackfoot River near Bonner, Montana on August 22, 2001. The sample site was located by GPS reading at 46° 54' 01" N, 113° 45' 18" W, lying within the Montana Valley and Foothill Prairies Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of either a composite of four Hess samples, or a one-minute kicknet collection (Bukantis 1998). Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Form for streams with riffle/run prevalence. Invertebrate samples were processed and animals identified by Rhithron Associates, Inc. Analysis of invertebrate assemblages was accomplished by applying the revised method (Bollman 1998) for streams of Western Montana's ecoregions. The method uses a multimetric battery to evaluate disturbance to biotic integrity.

The revised bioassessment metric battery and its scoring criteria have not been evaluated for application to higher-order streams and rivers; to date, no bioassessment method has been contrived for these waterways in Montana. Thus, the method used here is likely to have limitations in its applicability to the sites in this study. For example, 24 of the riverine or high-order waterways sampled for the fixed station study were located within Western Montana ecoregions and were sampled between July 23 and August 25, 2001. Mean water temperature for these sites at the time of sampling was 19.8°C (median = 19.4°). Temperatures ranged from 15.5°C (Kootenai River near Libby) to 25.3°C (Jefferson River near Three Forks). Ninety-eight sites from Western Montana were used to assemble the revised metric battery and to test it for sensitivity in detecting impairment, to establish scoring criteria, and to improve robustness of bioassessment. These 98 sites were mainly second and third order streams; the sampling season roughly corresponded to that of the fixed-station study. Mean water temperature for these sites at the time of sampling was 15°C (median = 14°C). Natural variations in benthic community composition and structure along longitudinal and thermal gradients are well known phenomena. Thus, scores and classifications were established for much smaller systems with significantly lower water temperatures; impairment classifications and use support designations in this study must be interpreted with care. Results from the application of other metric batteries may be found in the Appendix.

## RESULTS AND DISCUSSION

Table 1 itemizes the nine evaluated habitat parameters and shows the assigned scores for each, as well as the integrated score and condition category.

Overall habitat conditions scored optimally. The diversity of substrate particle sizes was somewhat less than expected. Otherwise, instream habitat parameters were perceived to be intact. Streambanks were judged stable, but some disruption of bank vegetation was reported on the left bank. The riparian zone width was observed to be extremely limited on the left side of the channel.

**Table 1.** Stream and riparian habitat assessment for a fixed station on the Blackfoot River. August 2001.

Max. possible score	Parameter	Blackfoot River near Bonner
10	Riffle development	10
10	Benthic substrate	8
20	Embeddedness	18
20	Channel alteration	19
20	Sediment deposition	17
20	Channel flow status	18
20	Bank stability: left / right	10 / 10
20	Bank vegetation: left / right	8 / 10
20	Vegetated zone: left / right	2 / 9
160	Total	139
	Percent of maximum CONDITION*	87 <b>OPTIMAL</b>

\*Condition categories: Optimal > 80% of maximum score; Sub-optimal 75 - 56%; Marginal 49 - 29%; Poor <23%. Adapted from Platkin et al. 1998.

**Table 2.** Metric values, scores, and bioassessment for a fixed station on the Blackfoot River. The revised bioassessment metric battery (Bollman 1998) was used for the evaluation. August 2001.

	Blackfoot River near Bonner	
METRICS	METRIC VALUES	METRIC SCORES
Ephemeroptera richness	4	2
Plecoptera richness	1	1
Trichoptera richness	9	3
Number of sensitive taxa	3	2
Percent filterers	56.8	0
Percent tolerant taxa	12.4	1
	<b>TOTAL SCORE (max.=18)</b>	9
	<b>PERCENT OF MAX.</b>	<b>50</b>
	<b>Impairment classification</b>	<b>MODERATE</b>
	<b>USE SUPPORT</b>	<b>PARTIAL</b>

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on the Blackfoot River is moderately impaired and only partially supports designated uses.

The biotic index value calculated for the sampled assemblage (4.39) was slightly elevated above expectations. When this finding is coupled with low mayfly taxa richness, as it is in this case, impairment of water quality by nutrients or elevated water temperature is suggested. Measured water temperature at the time of sampling was

19.4°C, which is average for rivers in the montane and foothill regions visited for the fixed stations study. Three cold stenothermic taxa were collected, including the stonefly *Doroneuria* sp. Mild nutrient enrichment seems the more likely cause of the mediocre performance of the mayfly richness and biotic index metrics.

The functional composition of the community appeared to be within expectations for a riverine environment. Filter-feeders were the major functional component of the community; the dominant taxon was the filter-feeding midge *Tanytarsus* sp. All of the other expected functional components of a riverine assemblage were well represented. Instream habitats appeared to be essentially intact, since taxa richness was high (36) and 6 predator taxa were collected. The paucity of stonefly taxa suggests that reach-scale habitat features such as streambank stability, riparian function, or channelization may have been limited to some degree. Sixteen “clinger” taxa and 9 caddisfly taxa were collected, suggesting that fine sediment deposition did not substantially alter the availability of hard substrate surfaces to colonization.

## CONCLUSIONS

- There is some evidence for mild nutrient enrichment in the biotic index and diversity of the mayfly fauna.
- Some impairment of reach-scale habitat features may be reflected in the dearth of stonefly taxa.
- The moderate impairment suggested by the bioassessment method used seems inappropriate, given the taxonomic composition and tolerance characteristics of the benthic assemblage. The quality of the fauna appears to be under-estimated by the bioassessment score; in particular, the proportion of filter-feeders seems to be only slightly elevated over expectations for a riverine environment. The contribution of tolerant taxa seems entirely appropriate. A classification of slight impairment may be more suitable for this site.

## LITERATURE CITED

Bollman, W. 1998. Improving Stream Bioassessment Methods for the Montana Valleys and Foothill Prairies Ecoregion. Master's (M.S.) Thesis. University of Montana. Missoula, Montana.

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft, April 22, 1997. Montana Department of Environmental Quality, Planning Prevention and Assistance Division. Helena, Montana.

Woods, A.J., Omernik, J. M. Nesser, J.A., Shelden, J., and Azevedo, S. H. 1999. Ecoregions of Montana (Color poster with map, descriptive text, summary tables, and photographs). Reston, Virginia: US Geological Survey.

## **APPENDIX**

### **Taxonomic data and summaries**

#### **The Blackfoot River**

**August 2001**

# Aquatic Invertebrate Taxonomic Data

Site Name: Blackfoot River near Bonner

Date: 8/22/01

Site ID: C03BLACR01

Approx. percent of sample used 17

Taxon	Quantity	Percent	HBI	FFG
<i>Dugesia</i> sp	9	2.78	4	PR
<i>Eiseniella tetraedra</i>	1	0.31	8	CG
Physidae	4	1.23	8	SC
<b>Total Misc. Taxa</b>	<b>14</b>	<b>4.32</b>		
<i>Acentrella insignificans</i>	2	0.62	4	CG
<i>Baetis tricaudatus</i>	3	0.93	4	CG
<i>Drumella spinifera</i>	1	0.31	0	PR
<i>Rhithrogena</i> sp.	1	0.31	0	CG
<b>Total Ephemeroptera</b>	<b>7</b>	<b>2.16</b>		
<i>Doroneuria</i> sp	1	0.31	0	PR
<b>Total Plecoptera</b>	<b>1</b>	<b>0.31</b>		
<i>Arctopsyche grandis</i>	1	0.31	2	PR
<i>Brachycentrus occidentalis</i>	39	12.04	2	CF
<i>Culoptila</i> sp.	20	6.17	1	SC
<i>Helicopsyche borealis</i>	3	0.93	3	SC
<i>Cheumatopsyche</i> sp.	11	3.40	5	CF
<i>Hydropsyche</i> sp.	43	13.27	5	CF
<i>Lepidostoma</i> sp.-sand case larvae	18	5.56	1	SH
<i>Oecetis</i> sp.	4	1.23	8	PR
<i>Psychomyia</i> sp.	14	4.32	2	CG
<b>Total Trichoptera</b>	<b>153</b>	<b>47.22</b>		
<i>Petrophila</i> sp.	17	5.25	5	SC
<b>Total Lepidoptera</b>	<b>17</b>	<b>5.25</b>		
<i>Optioservus</i> sp.	6	1.85	5	SC
<i>Zaitzevia</i> sp	8	2.47	5	CG
<b>Total Coleoptera</b>	<b>14</b>	<b>4.32</b>		
<i>Simulium</i> sp	1	0.31	5	CF
<i>Antocha</i> sp	2	0.62	3	CG
<b>Total Diptera</b>	<b>3</b>	<b>0.93</b>		
<i>Corynoneura</i> sp	1	0.31	7	CG
<i>Cricotopus Bicinctus</i> Gr.	1	0.31	7	CG
<i>Cricotopus (Isocladius)</i> Gr.	2	0.62	7	CG
<i>Cricotopus nostococladius</i>	2	0.62	6	PH
<i>Eukiefferiella Devonica</i> Gr	2	0.62	8	CG
<i>Eukiefferiella Gracel</i> Gr	4	1.23	8	CG
<i>Eukiefferiella Pseudomontana</i> Gr	1	0.31	8	CG
<i>Microtendipes</i> sp	4	1.23	6	CF
<i>Orthocladius</i> sp	5	1.54	6	CG
<i>Paratanytarsus</i> sp	1	0.31	6	UN
<i>Polypedilum</i> sp	1	0.31	6	SH
<i>Tanytarsus</i> sp	86	26.54	6	CF
<i>Thienemannimyia</i> Gr	1	0.31	5	PR
<i>Tvetenia</i> sp	4	1.23	5	CG
<b>Total Chironomidae</b>	<b>115</b>	<b>35.49</b>		

# Aquatic Invertebrate Summary

Site Name: Blackfoot River near Bonner

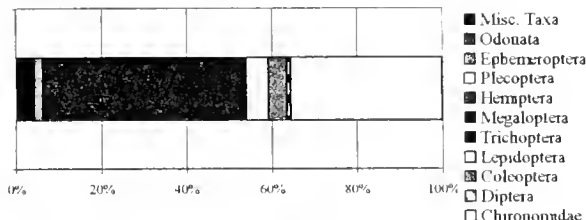
Date: 8/22/01

SAMPLE TOTAL 324

EPT abundance 161  
TAXA RICHNESS 36  
Number EPT taxa 14  
Percent EPT 49.69

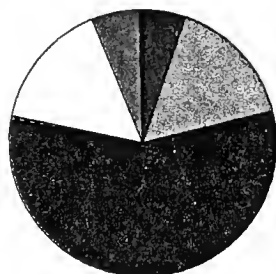
## TAXONOMIC COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Misc. Taxa	4.32	3	14
Odonata	0.00	0	0
Ephemeroptera	2.16	4	7
Plecoptera	0.31	1	1
Hemiptera	0.00	0	0
Megaloptera	0.00	0	0
Trichoptera	47.22	9	153
Lepidoptera	5.25	1	17
Coleoptera	4.32	2	14
Diptera	0.93	2	3
Chironomidae	35.49	14	115



## FUNCTIONAL COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Predator	5.25	6	17
Parasite	0.00	0	0
Gatherer	15.74	15	51
Filterer	56.79	6	184
Herbivore	0.00	0	0
Piercer	0.62	1	2
Scraper	15.43	5	50
Shredder	5.86	2	19
Xylophage	0.00	0	0
Omnivore	0.00	0	0
Unknown	0.31	1	1



## COMMUNITY TOLERANCES

Sediment tolerant taxa	2
Percent sediment tolerant	1.85
Sediment sensitive taxa	3
Percent sediment sensitive	5.25
Metals tolerance index (McGuire)	3.51
Cold stenotherm taxa	3
Percent cold stenotherms	1.23

Site ID: C03BLACR01

## DOMINANCE

TAXON	ABUNDANCE	PERCENT
<i>Tanytarsus</i> sp	86	26.54
<i>Hydropsyche</i> sp	43	13.27
<i>Brachycentrus occidentalis</i>	39	12.04
<i>Culepita</i> sp	20	6.17
<i>Lepidostoma</i> sp - sand case larva	18	5.56
SUBTOTAL 5 DOMINANTS	206	63.58
<i>Petrophila</i> sp	17	5.25
<i>Psychomyia</i> sp	14	4.32
<i>Cheumatopsyche</i> sp	11	3.40
<i>Dugesia</i> sp	9	2.78
<i>Zaitzevia</i> sp	8	2.47
TOTAL DOMINANTS	265	81.79

## SAPROBITY

Hilsenhoff Biotic Index 4.39

## DIVERSITY

Shannon H (loge) 2.31  
Shannon H (log2) 3.34

Simpson D 0.10

## VOLITINISM

TYPE	ABUNDANCE	PERCENT
Multivoltine	113	34.72
Univoltine	157	48.30
Semivoltine	55	16.98

## TAXA CHARACTERS

	#TAXA	ABUNDANCE	PERCENT
Tolerant	8	40	12.35
Intolerant	3	4	1.23
Clinger	16	226	69.75

## BIOASSESSMENT INDICES

B-IBI (Karr et al.)

METRIC	VALUE	SCORE
Taxa richness	36	3
E richness	4	1
P richness	1	1
T richness	9	3
Long-lived	2	1
Sensitive richness	3	3
%tolerant	12.35	5
%predators	5.25	1
Clinger richness	16	3
%dominance (3)	51.85	3
TOTAL SCORE	24	48 %

## MONTANA DEQ METRICS (Bukantis 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	36	3	3	3
EPT richness	14	3	2	0
Biotic Index	4.39	3	2	1
%Dominant taxon	26.54	3	3	2
%Collectors	72.53	2	2	1
%EPT	49.69	2	2	1
Shannon Diversity	3.34	3		
%Scrapers + Shredd	21.30	2	2	0
Predator taxa	6	3		
%Multivoltine	34.72	3		
%H of T	35		3	
TOTAL SCORES		27	19	8
PERCENT OF MAXIMUM		90.00	79.17	38.10
IMPAIRMENT CLASS		NON	SLIGHT	MODERATE

## Montana DEQ metric batteries



